LESSON 4

Happy Hunting

Procedure

Ask your students if caribou, moose or other prey species appear to be plentiful around their community. Do they know if these species are stable, increasing or declining? Do they see prey species often? Do they hunt or have family or friends who hunt? How is their hunting success? What affects their hunting success?

Wildlife populations fluctuate over time due to a number of conditions. Wildlife biologists study animals to understand why, and they are also interested in predator-prey dynamics and how that affects populations. In their studies, wildlife biologists look at habitat and at the condition of animals to see if they have enough food; they do studies to see if they are sick; they put collars on them to see where they go; and they also look at predation.

We are going to conduct an experiment to see what factors affect how fast a single predator (wolf) can kill prey (caribou). Then we are going to do another experiment to see what happens when predators hunt in a group, like a pack of wolves.

How do predators hunt? They search around and find something they can catch and they eat it. Wolves often eat large prey so it can take while to eat the prey.

How many caribou are out there? If there are a lot of prey, wolves should be able to catch more because caribou should be easier to find.

Search time is a factor, but handling time matters too. Wolves hunt in packs, so they get some help finding prey; other wolves know where to go or pick up a scent or spot prey the leader missed.

Experiment 1

How does searching and handling affect hunting success?

Split the class into groups of six students. The groups will repeat each round of experiments twice. As a result, there will be enough trials to provide statistically viable information. Place different numbers of 4 cm disks of sandpaper on a 3' x 3' piece of cardboard (you can also substitute a towel or butcher paper) that is set on a table or floor (ie: playing field). The disks are the prey. You may substitute the sandpaper disks with other objects, such as pennies or poker chips.

NOTES

Rules for the Experiments

1. Hunting Wolf
   - Blindfolded (chin down, no peeking)
   - One-handed—use only one hand or hunting
   - One finger tapping (no sliding, no palms)
   - A wolf may pick up two disks at once if they are stacked. If disks fall on the floor, they are lost and do not count.
2. Pups may only handle one disk at a time
3. Other adult wolves
   - May direct (talk to) hunting wolf
   - May take disks from hunting wolf and handle
   - Cannot pick up disks

Round 1: Start with four disks haphazardly arranged on the playing field. Our predator is a blindfolded student wearing a fanny pack or other type of pouch, such as a Ziploc bag on a string. The predator hunts the disks by tapping one finger around the table trying to feel a disk. When the predator finds a disk it takes the disk and puts it in the fanny pack, closes the pack, and resumes hunting. The predator has 60 seconds to find disks and put them in the pack. The tapping is the search time and picking up the disk and putting it in the fanny pack is the handling time. We don't need to keep track of those times, simply count the number of disks the predator caught in 60 seconds.

Reset the board and repeat the experiment with one or two more predators from that class.

Round 2: Now place nine disks on the board and do it all over again. There is more prey now so the disks are easier to find, but it still takes the same amount of time to put each disk in the pack, one at a time.

This experiment is repeated with boards containing 16, 25, 49, 81, 100, disks. Then make a graph of the number of disks captured in each trial.

From the graph, we can see that search time limits the number of prey caught when there are few prey. The number of prey captured increases quickly when increasing the number of prey available, because they are easier to find. But, when there is a lot of prey available, and we add more prey, the predator can't catch them any faster. It is too busy eating (putting them in the fanny pack). Search time is the big factor when prey are scarce and handling time is the big factor when prey are plentiful.

This experiment was first done in 1959 by an insect biologist named C.S. Holling. From this experiment, he developed the equations that biologists use to understand how predator success affects predator-prey relationships. Hundreds of experiments and field studies have been done since then to refine his basic ideas. Exploration of this concept is ongoing, and the data your class collects from these experiments may be used by the Alaska Department of Fish and Game for scientific papers on the subject.

Experiment 2

How do additional pack members affect hunting success?

Round 1: Young wolves What happens when a predator does not hunt all by itself? What happens when predators hunt in groups, like a pack of wolves? In the first example, we simulated a wolf that killed a caribou that was twice her size and it took her a while to eat it. But if she had a bunch of youngsters with her, they would eat the caribou too and it would not take as long. We simulated the time it took her to eat it by making our wolf put the disk into a fanny pack. So let's give our wolf some help eating those caribou.

The set-up is the same but now we have a pack of six wolves. Three to five of these wolves are youngsters. They do not know how to hunt yet, but they sure know how to eat! The five young are not blindfolded, but they each wear fanny packs. When the blindfolded adult catches a disk, it just hands it to one of the others. They open their fanny packs, put the disk in, and close it up again. But the adult must put every sixth disk it catches in its own fanny pack, because it has to eat too.

At the end of 60 seconds, we tally the number of disks caught. Then add more prey to the habitat and repeat. Use the same number of disks for each trial as used in first experiment (4, 9, 16, 25, 49, 81, 100). Complete as many trials as time allows.

ADF&G biologists have developed computer simulations showing that the curve on the graph will be very similar until it starts to plateau at the top. In this experiment, the curve will go much higher before it levels out. We expect the result will be that the maximum kill rate is much higher when handling time is reduced. We can also see how many disks there are per wolf at the end of the trials and see how many disks have to be available to feed the wolves. And when some wolves will not got enough disks and have to leave the pack.

Round 2: Additional adults help find and capture prey
This time we have a pack of wolves, but one of the wolves gets to help the blindfolded wolf in the following fashion: The helper wolf can tell the blindfolded wolf where to tap. For example, if the hunting wolf taps close to but misses a disk, the helper can say "left" or "back" or whatever helps. The helper can also direct the hunter to areas of the table that have a lot of disks. This simulates the condition where the other adults have information about where prey might be and also have experience that helps the hunter find prey.

Also, when the hunter finds a disk, the helper gets to pick it up and hand it to the youngsters. This simulates the condition where other adults actually help catch the prey once it is located. Again, both adults have to "eat" every 5th and 6th disks. And, again, we repeat this for the different prey availabilities.

The expected result is that the curve will go up steeper, that is, searching will be much more efficient, especially when a low number of prey are available. We should see a little increase in the maximum kill rate too.

Evaluation

- Generate a curve using data collected in your trials and submit it to the Department of Fish and Game.
- Contribute results of your trials to ADF&G. Please send to:

  Brenda Duty, Project WILD Coordinator
  Division of Wildlife Conservation
  333 Raspberry Rd.
  Anchorage, AK 99518
  Email: brenda.duty@alaska.gov
- Relate the data to your original question and hypothesis. Write a summary of what you found out and what you learned. How might this information be helpful for future management of this species?

Extensions

A. Learn more about predator-prey relationships in various wildlife populations around the world. Look at historical data and discuss how the predator-prey relationship changes over time.

B. Talk to local elders, hunters, trappers, and resources biologists to find out more information about local wildlife populations. What are they perspectives on this cycle?

C. Play the **Mark and Recapture** tag game on p. 181.

Additional Resources

Online

Alaska Dept. of Fish & Game
http://www.adfg.alaska.gov